



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Adams COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/032,353	12/21/2001	Ming-Huan Tsai	67,200-567	4994

7590 10/08/2003
TUNG & ASSOCIATES
838 W. Long Lake Road, Suite 120
Bloomfield Hills, MI 48302

EXAMINER

TRINH HOA B

ART UNIT	PAPER NUMBER
----------	--------------

2814

DATE MAILED: 10/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application N .	Applicant(s)	
	10/032,353	TSAI ET AL.	
	Examin r	Art Unit	
	Vikki H Trinh	2814	

-- Th MAILING DATE of this communication appears on the cover sh et with th correspond nc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____. | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

Claim Objections

1. Claim 1 is objected to because of the following informalities: in line 8, “an exposure” should be “and exposure”. In line 11, “of” should be inserted before the word “the”.
Appropriate correction is required.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 6-7 are rejected under 35 U.S.C. 102(e) as being anticipated by Young et al. (6,514,672).

As to claim 1, a method for semiconductor device feature development using a bi-layer photoresist comprising the steps providing non-silicon containing photoresist layer 18 (col 2, line62) over substrate 10; providing silicon containing photoresist (col. 3, line2) over the non-silicon containing photoresist layer; exposing said silicon containing photoresist layer to an activating light source and exposure surface defined by an overlying pattern according to a photolithographic process (col. 2, line 41); developing said silicon containing photoresist layer to an photolithographic process to reveal a portion of the non-silicon containing photoresist layer;

Art Unit: 2814

and dry developing said non-silicon containing photoresist layer (col. 3, lines 27-55) in a plasma reactor by igniting plasma from an ambient mixture including oxygen. See figure 4.

As to claim 6, wherein the non-silicon containing thickness greater than silicon photoresist layer has containing photoresist layer. Col. 2, line 60, and col. 3, line 3.

As to claim 7, wherein the non-silicon containing photoresist layer has thickness about 1000 Angstroms about 5000 Angstroms and the silicon containing photoresist layer has a thickness of about 500 Angstroms to about 3000 Angstroms. Col. 2, line 60, and col. 3, line 3.

3. Claims 1-3, 5 are rejected under 35 U.S.C. 102(b) as being anticipated by Horn (5,925,494)

As to claim 1, a method for semiconductor device feature development using a bi-layer photoresist comprising the steps providing non-silicon containing photoresist layer 62 (col 21, lines 30-35) over substrate 10; providing silicon containing photoresist 64, 66 (col. 22, lines 23, 61) over the non-silicon containing photoresist layer; exposing said silicon containing photoresist layer to an activating light source and exposure surface defined by an overlying pattern according to a photolithographic process (col. 21, line 10); developing said silicon containing photoresist layer to an photolithographic process to reveal a portion of the non-silicon containing photoresist layer; and dry developing said non-silicon containing photoresist layer in a plasma reactor (col. 18, line 61) by igniting plasma from an ambient mixture including oxygen. See figure 12.

Art Unit: 2814

As to claim 2, wherein the plasma reactor includes at least one RF power source for plasma excitation and at least one power source accelerating plasma generated towards the substrate surface. (col. 7, lines 1-5)

As to claim 3, the method photoresist layer claim wherein the non-silicon containing comprises a non-photoactive polymer. Col. 8, lines 5-15.

As to claim 5, wherein the activating light source has a wavelength that encompasses the claimed wavelength of 157 nanometers and about 193 nanometers. See col. 4, lines 65-66. method of claim reactively layer using hydrofluorocarbon containing plasma least partially form the semiconductor feature including one of a and contact hole.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various

claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 4, 8-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horn in view of Young et al..

As to claims 8-9, Horn discloses the invention substantially as claimed. However, Horn does not explicitly teach the step of in-situ ashing process.

Young et al. teaches the method of forming a semiconductor device having the step of ashing process after the dry development step using oxygen. Col. 3, lines 60-67.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Horn with an ashing process, as taught by Young et al., so as to improve the edge roughness. See Young et al., col. 3, lines 60-61.

As to claims 4, 10, 12, 16, 17, Horn teaches the invention substantially as claim. However, Horn does not explicitly teach a specific concentration range for each ambient gas such as oxygen, carbon, argon, and fluorine, relative to one another. (Horn., col. 8, lines 10-25). Nonetheless, it would have been obvious to artisan's optimization and experimentation to select the range of concentration, because applicants have not yet established any criticality.

As to claims 11, wherein the semiconductor feature includes one hole, trench contact hole, a shallow trench isolation feature, and a polysilicon gate feature. See Young et al., col. 4, lines 7-24.


As to claims 13-14, 19, a second in-situ ashing process step to remove the photoresist layer using oxygen ions. See Young et al., col. 4, lines 1-4.

As to claim 15, 18, wherein plasma operating conditions include maintaining an ambient pressure of about 5 about 20 mTorr, supplying power to the first RF power source at About 200 to about 300 Watts, and supplying power to the second RF power source at about 100 to about 150 Watts. See Young et al., col. 3, lines 63-65.

Conclusion

- Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Vikki Trinh whose telephone number is (703) 308-8238. The Examiner can normally be reached Mon-Tuesday, Thurs-Friday, 7:30 AM - 6:00 PM Eastern Time. If attempts to reach the examiner by telephone are unsuccessful, the Examiner's supervisor, Mr. Wael Fahmy, can be reached at (703) 308-4918. General inquiries relating to the status of this application should be directed to the Group receptionist at (703) 308-0858. The fax number is (703) 308-2708.

Vikki Trinh,
Patent Examiner
AU 2814


SUPERVISOR
TECHNICAL CENTER 100